

**Amendments to the Claims:**

A clean version of the entire set of pending claims, including amendments to the claims, is submitted herewith per 37 CFR 1.121(c)(3). This listing of claims will replace all prior versions, and listings, of claims in the application.

**Listing of Claims:**

1-14. (Cancelled)

15. (Currently Amended) A method comprising:

[[ - ]] using a first magnetic field generator disposed on a substrate to generate ~~an~~ a first AC magnetic field,

using a second magnetic field generator disposed on the substrate to generate a second AC magnetic field;

[[ - ]] sensing with a magnetic sensor element also disposed on the substrate a magnetic property of at least one magnetic particle which magnetic property is related to the first and second AC magnetic fields ~~field,~~ wherein a frequency of the first AC magnetic field is at least 100 Hz, and wherein a frequency of the second AC magnetic field is different than the frequency of the first AC magnetic field and is also at least 100 Hz;

demodulating an output signal of the magnetic sensor element to produce two detection signals corresponding to the first and second AC magnetic fields; and

processing the two detection signals to determine a number of the one or more magnetic particles, and corresponding positions of said one or more magnetic particles.

16. (Currently Amended) The method of claim 15, wherein the frequency of the first AC magnetic field and the frequency of the second AC magnetic field each have ~~has~~ a value such that thermal white (Nyquist) noise of the magnetic sensor element is dominant over 1/f noise of the magnetic sensor element.

17. (Canceled)

18. (Currently Amended) The method of claim 15, wherein a direction of the generated first AC magnetic field is mainly perpendicular to a plane of the magnetic sensor element in an immediate vicinity of the magnetic sensor element.

19-23. (Canceled)

24. (Previously Presented) The method of claim 15, further comprising:  
detecting a binding reaction of a target sample with a binding site disposed on the substrate, wherein the binding reaction brings the at least one magnetic particle into a vicinity of the magnetic sensor element and the magnetic sensor element detects the binding reaction by detecting the presence of the at least one magnetic particle.

25. (Previously Presented) The method of claim 24, wherein the target sample is one of a biological sample and a chemical sample.

26. (Previously Presented) The method of claim 15, wherein the substrate is a semiconductor substrate.

27. (Previously Presented) The method of claim 15, wherein the substrate is a glass substrate.

28-37. (Canceled)

38. (New) The method of claim 15, wherein at least portions of the first and second AC magnetic field generators lie in a same plane as each other.

39. (New) The method of claim 38, wherein the magnetic sensor element is also disposed on the substrate, at least a portion of the magnetic sensor element lying in the same plane as the portions of the first and second AC magnetic field generators.